

Reassessing Hypoxia Forecasts for the Gulf of Mexico

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Gulf of Mexico hypoxia has received considerable scientific and policy attention because of its potential ecological and economic impacts and implications for agriculture within its massive watershed. A 2000 assessment concluded that increased nitrate load to the Gulf since the 1950s was the primary cause of large-scale hypoxia areas. More recently, models have suggested that large-scale hypoxia did not start until the mid- 1970s, and that a 40–45% nitrogen load reduction may be needed to reach the hypoxia area goal of the Hypoxia Action Plan. Recently, USGS revised nutrient load estimates to the Gulf, and the Action Plan reassessment has questioned the role of phosphorus versus nitrogen in controlling hypoxia. In this paper, we evaluate model simulations, hindcasts, and forecasts using revised nitrogen loads, and test the ability of a phosphorus driven version of the model to reproduce hypoxia trends. Our analysis suggests that, if phosphorus is limiting now, it became so because of relative increases in nitrogen loads during the 1970s and 1980s. While our model suggests nitrogen load reductions of 37–45% or phosphorus load reductions of 40–50% below the 1980–1996 average are needed, we caution that a phosphorus-only strategy is potentially dangerous, and suggest it would be prudent to reduce both.